PG/IIS/ELC/201/23

M.Sc. 2nd Semester Examination, 2023

ELECTRONICS

(*Electromagnetism and Antenna*)

PAPER – ELC-201

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

1. Answer any *four* questions : 2×4

(*a*) Why a wave guide behaves like a high pass filter ? 2

(*b*) Define directivity and gain of an antenna. 1 + 1

(*c*) Why TEM mode can not propagate inside a Hollow wave guide ? 2

(*d*) Draw the E & H plane radiation patterns of half wave dipole antenna. 2

(*e*) What are the boundary conditions of E & H field in the interface between dielectric and conductor ? 1 + 1

(*f*) How a transmission line can be used as step-up transformer ? 2

2. Answer any *four* questions : 4 × 4

(*a*) Deduce relegraphen's equation for transmission line. 4

(*b*) What are maximum useable frequency and skip distance with reference to ionospheric propagation ? 2 + 2

(*c*) How a transmission line is made distortion less line ? 4

(*d*) What are loss-less & low-loss transmission line ? Find characteristic impedance and propagation constants for both cases. 2 + 2

(*e*) A rectangular waveguide has the following parameters. 2 + 2

$a = 1.5$ cm, $b = 3.0$ cm, $\mu_r = 1$ and $\epsilon_r = 1$.

(*i*) Find cut-off frequency for TE_{10} and TM_{11} mode.

(*ii*) Find guide wavelength and characteristic impedance z_0 of the line.

(*f*) Write down Maxwell's equation in Integral and Differential form. 2 + 2

3. Answer any *two* questions : 8 × 2

(*a*) A transmission line of characteristic impedance 100 Ω is terminated with the load $z_L = 100 + j60$. With the help of Smith chart find

(*i*) Reflection co-efficient at load.

(*ii*) SWR on the line.

(*iii*) Maximum and minimum impedance on the line.

(*iv*) Distance of maximum and minimum voltage from the load. 2 + 2 + 2 + 2

(*b*) Deduce E & H field in far field region of a Hertzian dipole. 8

(*c*) (*i*) Why sky wave and ground waves are complementary to each other.

(*ii*) Deduce expression for 'Scant law'. 3 + 5

(*d*) Find expressions for the real and imaginary parts of propagation constant for the propagation of wave in conducting medium. 4 + 4

[Internal Assessment – 10 Marks]